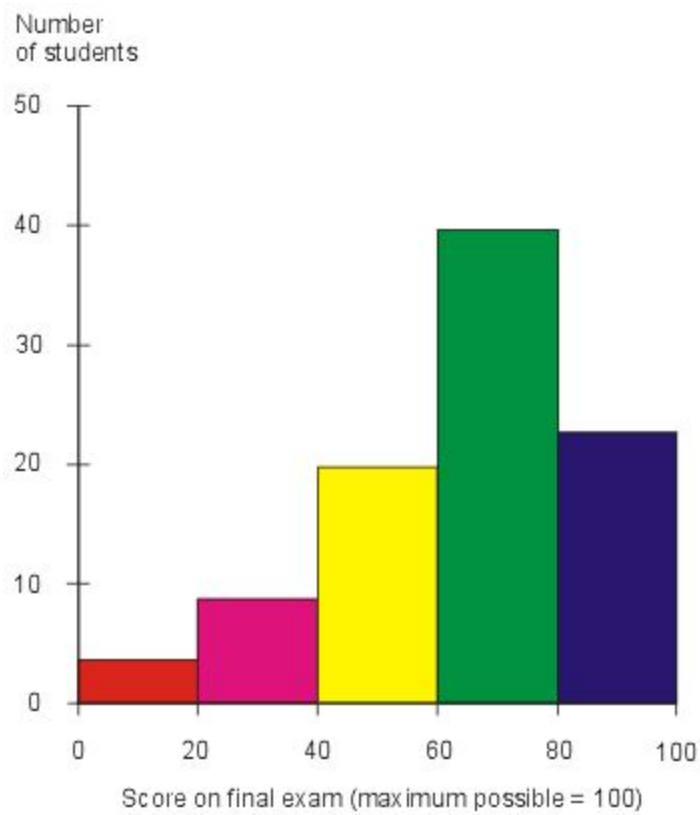


# Introducing Statistics:

## Representing Statistical Questions Using Histograms

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November 12, 2017  
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## **Section 1: Content Considerations**

### **1.1 Central focus**

Representing statistical questions using histograms

### **1.2 Rationale**

Statistics are all around us, representing important information about events in the world and our lives. Frequently, we encounter statistics in the form of graphs that are designed to convey important information about a dataset. In this unit, we will examine how a particular kind of graph, a histogram, can help us interpret and understand a particular dataset. First, students must understand that histograms represent statistical data, or the the data that corresponds to a statistical question. Students will begin by learning that a statistical question is one that anticipates variability in a dataset. Then, students will practice identifying and creating their own statistical questions. Once students have developed a conceptual understanding of statistical questions, they will apply it by using histograms to graph statistical questions that are relevant to their own lives. And finally, students will be asked to draw conclusions about the relevance of a statistical question to their own lives via the summative assessment.

This unit is structured so that students are introduced to concepts in chunks (by day). This way, they will have adequate time to become familiar with each new piece of information, as well as practice it and ask questions about it, before moving on. Since mathematics continues to build on students' existing knowledge, it is important that I ensure my students have reached an adequate level of understanding before moving forward; otherwise, students risk being left behind as the concepts and skills become more advanced. (If they do not understand what a statistical question is, how can they ask meaningful statistical questions about their lives?) Chunking is especially important for my students who become easily frustrated when they do not find immediate success in a task. Even though my students have demonstrated above grade level performance in many content areas, their abilities and motivations vary. Accordingly, I have structured this unit so that students have many

opportunities to build confidence with the content before completing a summative assessment and moving on to more advanced concepts in statistics.

### **1.3 What will students know and be able to do with this knowledge?**

Students will know how to ask and investigate a statistical question, then plot the data using a histogram. Students will be able to make relevant applications of the data to their own lives and peers.

### **1.4 Unit level learning targets**

Learning Target	Type of LT	Standard
Students will understand that a statistical question anticipates variability in the data.	Concept	CCSS.MATH.CONTENT .6.SP.A.1
Students will be able to recognize and ask statistical questions.	Skill	CCSS.MATH.CONTENT .6.SP.A.1
Students will understand that a histogram represents the frequency distribution of numerical data.	Concept	CCSS.MATH.CONTENT .6.SP.B.4
Students will be able to represent numerical data using histograms.	Skill	CCSS.MATH.CONTENT .6.SP.B.4
Students will appreciate that data obtained using statistical questioning can help them interpret, understand, and make decisions about information important in their lives.	Disposition	CCSS.MATH.CONTENT .6.SP.B.4

### **1.5 Connections between learning targets, development of conceptual understanding, procedural fluency, mathematical reasoning, or problem solving skills**

The unit level learning targets aspire to help students understand statistical questions and histograms, and to be able apply this knowledge in realistic situations that matter in their lives. First, students will attain a conceptual understanding of statistical questions and will practice asking statistical questions relevant to their own lives, allowing them to first gain conceptual understanding and then reach procedural fluency (Learning Targets 1 and 2). Through the 3rd learning target, students will be introduced to histograms as a way of displaying data obtained from the investigation of statistical questions. Finally, students will tie together the

concepts and skills they have learned by asking, investigating, and graphing a statistical question (Learning Target 4). Throughout the unit, we will focus on the dispositional learning target of recognizing that they can analyze data to make important decisions about their lives (Learning Target 5). First, students will understand this concept, and by the summative assessment they will have developed procedural fluency in applying statistical questions to problems in their own lives.

## 1.6 Develop an essential question

How can we ask and analyze statistical questions that help us make decisions about the world?

## Section 2: Classroom Context for Learning

### 2.1 - 2.2 Describe the students in your class how their characteristics influence instructional strategies

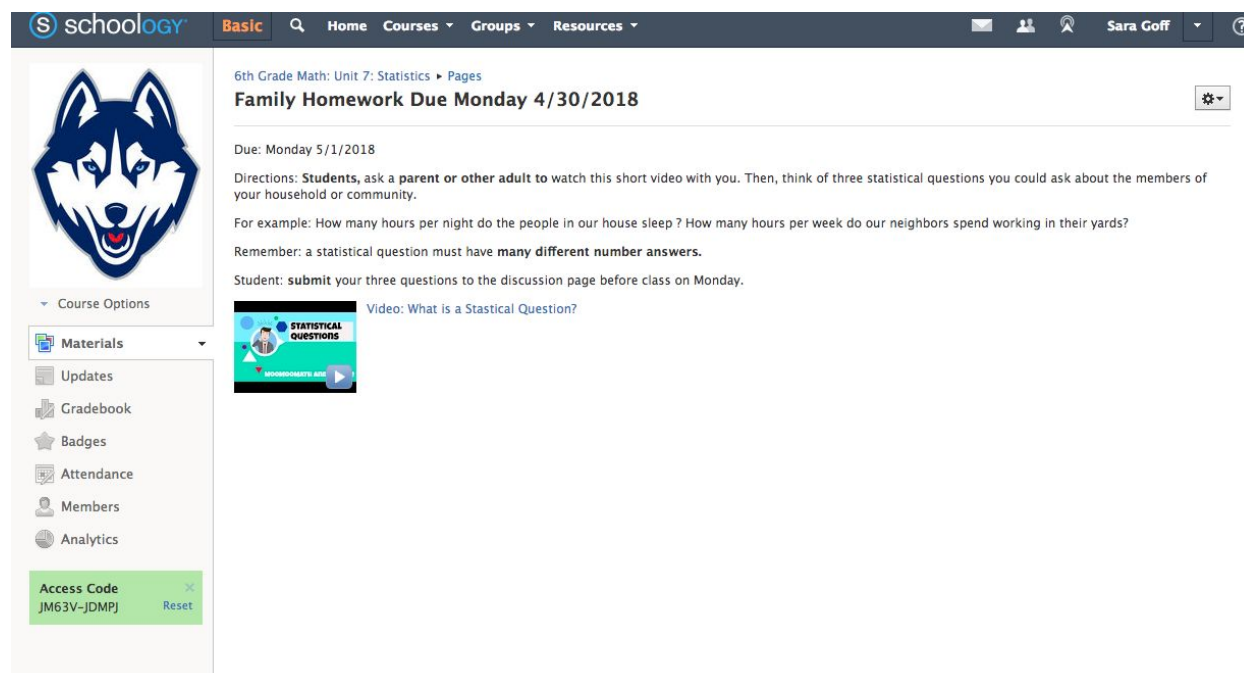
	Description of students (2.1)	Instructional Strategies (2.2)
<b>a. Academic Development</b>	<p>This is a class made up of students from the school's Highly Capable Cohort, so they have demonstrated high academic abilities across several content areas.</p> <p>Students in this class generally approach new topics with excitement. As part of the highly capable cohort, most are confident taking on new challenges. However since these students are used to being successful, they become easily frustrated when they do not immediately succeed. This can lead students to have a fixed mindset with regard to a particular subject or topic.</p>	<p>To ensure that all of my students remain engaged in the lesson, I will keep track of their understanding through frequent informal assessments. When individual students encounter challenges, I will work with them 1:1 to reach understanding. I will also create opportunities for students who feel challenged to ask questions without feeling embarrassed. One example of this will be exit tickets which invite students to ask any questions that they did not have a chance to ask in class.</p>
<b>b. Academic Language Development</b>	<p>As members of the highly capable cohort, students are all grade-level or above in terms of language. There are not any ELL students in this class. Students routinely locate and define academic language in their texts and other academic sources.</p>	<p>To help my students solidify their understand of the vocabulary and build confidence using it, they will be required to use academic language specific to this unit in writing and in classroom conversations. When students are asked to record vocabulary terms in their math journals, the terms will be displayed on the board for</p>

		them to copy down as well as available on Schoology for future reference.
<b>c. Social and Emotional Development</b>	My sixth grade students have various stages of social and emotional development. As 11 and 12 year olds, they are experiencing a flurry of changes in their bodies and brains. Some students are more capable than others of executive function and self regulation. Overall however, my students are generally successful in school settings.	According to Chip Wood's <i>Yardsticks</i> , 11 and 12 year olds enjoy working in groups and are successful in cooperative learning settings. As such, I will create many opportunities for students to engage with and learn from each other (Wood 2007). Students will turn and talk, think, pair, share, etc., as well as participate in cooperative learning for their summative assessment.
<b>d. Family/Community /Cultural Assets</b>	The students in this class know each other very well as a result of being part of the highly capable cohort. They share many of their classes, and most have good relationships with one another.	In order to create a culturally responsive classroom, I will take care to ensure that connections are made between the curriculum and students' lives, including their cultural backgrounds, interests, and lived experiences. I will also build upon the students' culture of community by creating opportunities for them to work collaboratively to solve meaningful problems.
<b>e. Dispositions related to the unit's central focus: do they see math as sensible, useful, worthwhile? Do they persevere in problem solving efforts?</b>	<p>Some of my [social studies] students do not always view math as useful, worthwhile, or relevant to their lives--I know this because of conversations we have had in which they describe and explain their favorite subjects. Despite this, my students are generally excited about taking on challenges, even in math. If they do not immediately succeed, these students tend to become frustrated.</p> <p>Other students, however, do have an appreciation for math as a useful and worthwhile endeavor. These students plan to pursue engineering or science careers in the future, or they have parents who are</p>	To help all my students see the content in this unit as relevant and worthwhile, I have asked them to consider, on several occasions, statistical questions that could be asked <i>specifically</i> about the students in our class. Working with these questions, students will investigate problems and issues that could be analyzed through data, as well as solutions that could be suggested based on statistical data. Hopefully, all students will develop an appreciation of how they can use statistics and visual representations to interpret mathematical information and make meaningful applications in their own lives.

	knowledgeable about or involved in the technology industry.	
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## 2.3 Family Involvement (web page)

- Describe highlights of unit
- Describe at least one family-involvement activity that could be done at home
- Invite two-way communication
- Insert URL (also need hard copy) → JM63V-JDMPJ



Schoology Basic Home Courses Groups Resources Sara Goff

6th Grade Math: Unit 7: Statistics Pages

**Family Homework Due Monday 4/30/2018**

Due: Monday 5/1/2018

Directions: **Students**, ask a **parent or other adult** to watch this short video with you. Then, think of three statistical questions you could ask about the members of your household or community.

For example: How many hours per night do the people in our house sleep ? How many hours per week do our neighbors spend working in their yards?

Remember: a statistical question must have **many different number answers**.

Student: **submit** your three questions to the discussion page before class on Monday.

Video: What is a Statistical Question?

Access Code JM63V-JDMPJ Reset

Due: Monday 5/1/2018

Directions: **Students**, ask a **parent or other adult** to watch this short video (with you. Then, think of three statistical questions you could ask about the members of your household or community.

For example: How many hours per night do the people in our house sleep ? How many hours per week do our neighbors spend working in their yards?

Remember: a statistical question must have **many different number answers**.

Student: **submit** your three questions to the discussion page before class on Monday.

Video: <https://www.youtube.com/watch?v=xj95mYTl9MY>



Washington Middle School  
2101 S. Jackson St.  
Seattle, WA 98144  
April 20, 2018

Dear Families,

Soon we will begin our final math unit of the year: statistics! As we approach this exciting topic, I want to briefly preview the content we will cover. To begin, I have asked students to complete a short activity at home that introduces them to statistical questions (see Schoology for more information). This assignment will be due on the first day of the unit: Monday, April 30.

In class, we will begin by practicing asking statistical questions and collecting data about the members of our class. Then, we will move on to represent our data using histograms. (Later in the unit, students will graph data using other methods, such as box and whisker plots, etc.) As emerging participants in a democratic society, it is valuable for students to understand how they can become civically involved. In this unit, students will learn how they can use graphs to analyze and interpret data, draw conclusions about it, and finally **take action** based on it.

To conclude the first week of the statistics unit, students will demonstrate their learning through a project which asks them to work in partners to investigate a statistical question relevant to their life or community, plot the data using a histogram, and draw a conclusion or suggest an action based on that data. Our hope is that this project will help students recognize how statistics can be useful to make informed decisions about their lives and the world.

We are excited to begin this unit with your students! As always, please do not hesitate to contact us with any questions or concerns.

All the best,

Sara Goff  
Student Teacher  
6th Grade Math

### Section 3: Plan for Instruction

#### Day 1: Introducing Statistical Questions and Variability

Learning Target (3.1.ii)	Evidence of Achievement (3.1.iii)	Assessment (3.2)
Students will understand that a statistical question is one that anticipates variability in the response data. (Concept)	Students will write statistical questions that can be asked about their class.	Formative assessment: teacher will observe students during class and make accommodations/adjustments as necessary.  Formative assessment: teacher will be able to compare students' questions created for family homework and the ones on the exit ticket to assess individual learning.
Students will be able to identify and create statistical questions. (Skill)	Students will successfully categorize questions into statistical or non statistical using T charts. Students will explain their reasoning during "vote with your feet" activity.	Formative assessment: teacher will observe students during class and make accommodations/adjustments as necessary.

Academic Language (3.1.ii)	Statistical Question Non statistical Question Variability
Required Materials	Smart Board Document Camera Laptops: one per every two students Math Journals
Co-teaching Strategies	One teach, one assist

#### Lesson Narrative (55 minutes total)

##### Intro (~15 minutes)

Prior to beginning this lesson, students will be asked to watch a short video at home introducing statistical questions (<https://www.youtube.com/watch?v=xj95mYTl9MY>). When they arrive to class, there will be a "do now" assignment on the board asking students to sort a list of ten questions into categories: statistical and nonstatistical. Students will have ~5 minutes to sort



the questions using a T-chart. Then, students will “vote with their feet” whether questions are statistical or nonstatistical as the teacher reads through each question. This will be an opportunity for the teacher to conduct an informal assessment; if most students vote correctly, the teacher can move forward with instruction. If many students are struggling, the teacher can pause to provide additional instruction about statistical questions.

### **Direct Instruction (~15 minutes)**

First, the teacher will point out that an important feature of statistical questions is that they must be asked about a specific group or population, such as Ms. Goff’s 2nd period, residents of Seattle, etc. Teacher will invite students to generate a list of 5-6 more specific populations, which the teacher will copy on a sheet of chart paper that will remain displayed in the classroom throughout the unit.

Next, the teacher will introduce the vocabulary word, variability. The teacher will explain that, for now, variability refers to the expectation of more than one numerical responses to a statistical question--or the expectation that answers will vary. The teacher will explain that the rest of the unit will involve graphing and analyzing different features of the dataset. Students will record the following definitions and examples in their math journals:

**Statistical Question:** A) is asked about a specific population B) anticipates more than one answer that can be expressed as a number (*What are the shoe sizes of the students at Washington Middle School?*)

**Non statistical Question:** Can be answered only one way (*Eg. What is your shoe size?*)

**Variability:** The expectation of many different number answers

### **Guided Practice (~15 minutes)**

Now, the teacher will invite students to consider statistical questions they could ask about the class. In partnerships, students will generate a list of at least five statistical questions

that could be asked about the class. Students will have ~8-10 minutes to work in partnerships to generate questions, and will submit their questions to the discussion page on Schoology.

For example, a valid statistical question about the class might be, what are the shoe sizes of the students in Ms. Goff's 2nd period class? This is a valid statistical question because:

- a) shoe sizes are expressed as a numerical value,
- b) all the students (probably) do not have the same shoe size (so it anticipates variability)
- c) "Ms. Goff's 2nd period class" represents a specific population

### **Closure (~10 minutes)**

After partnerships submit their questions, the teacher will invite students to ask any lingering questions about the content covered in class. The teacher will tell students that tomorrow, they will be using the questions they created to collect and organize data about the class using frequency distribution tables. To conclude, students will complete an exit ticket asking them to create one example of a statistical question and one example of a non statistical question.

## Day 2: Data Collection

Learning Target (3.1.ii)	Evidence of Achievement (3.1.iii)	Assessment (3.2)
Students will understand that a statistical question requires data collection in order to be answered.	Students will consider statistical questions they could ask and collect data on. Students will participate in data collection by recording their answers to statistical questions.	Formative assessment: teacher will monitor students during class activities and make accommodations and adjustments as necessary.

Academic Language (3.1.ii)	Data Collection
Required Materials	Smart Board Document Camera Math Journals Chart Paper
Co-teaching Strategies	One teach, one assist

### Lesson Narrative (55 minutes total)

#### Intro (~10 minutes)

Students will complete a warm up activity that asks them to consider a sample dataset of responses to a statistical question. Students will have 2 minutes to observe the data, then there will be an opportunity to share out observations.

The teacher will tell students that today will be spent collecting data about the students in our class based on the statistical questions students created the previous day.

#### Guided Practice: Data Collection (~15 minutes)

Prior to the lesson, the teacher will have read through the statistical questions generated by partnerships and copied 10 of them onto sheets of chart paper hung throughout the room. Students will circulate the room and respond to each question based on their own experiences.

Example:

How many pets do the students in Ms. Goff's 2nd period have?
--

Student responses:

2 5 2 7 3 0 3 1 5 3 2 5 2 7 3 0 3 1 5 3

### Direct Instruction (~10 minutes)

Students will return to their seats once they have completed the data collection activity. The teacher will choose one of the questions as an example to define frequency distribution. The teacher will introduce the vocabulary word, **frequency distribution**, and explain that it represents the number of times a specific response occurs in a dataset. Ask students to **turn and talk** about the example dataset, and ask what conclusions they can draw from it. Students should be able to interpret that two students in the class have 0 pets, that one student has 4 pets, etc. Point out that we can also tell, from counting the number of responses, how many people answered the question (the size of the dataset should be equal to the number of students in the class). Students will record the following definition in their math journals:

**Frequency Distribution:** frequencies and their values (how often each value occurs)

Next, students will have ~15 minutes to circulate the room and record the class data for each of the questions. Students will use a worksheet as shown below; the question box will already have been completed by the teacher, and students will simply have to record the numerical values of student responses in each box. There are exactly 25 boxes to help students stay organized; we anticipate 25 number answers because 25 total students will be surveyed. Tell students these class datasets are important because we will be returning to them for a variety of activities throughout the unit on statistics. (In the coming weeks, we will analyze the data in terms of mean, median, and mode, and practice graphing it using box-and-whisker plots.)

(Example) Question:

How many hours per week do the students in Ms. Goff's 6th period class spend playing

sports?

(Example) Class Responses:

2	4	2	2	5	0	8	4	0	0	2	3	5	4	3	5	7	6	4	3	5	6	0	3
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

**Closure (~5 minutes)**

Teacher will invite students to ask lingering questions about the content, and students will complete an exit ticket which asks them to interpret a dataset and answer three questions about it.

### Day 3: Creating and Interpreting Histograms

Learning Target (3.1.ii)	Evidence of Achievement (3.1.iii)	Assessment (3.2)
Students will understand that a histogram is created by sorting numerical frequency data into categories called “buckets.” (Concept)	Students will discuss the importance of the creation of “buckets” to organize data.	Formative assessment: teacher will monitor students’ understanding by asking questions throughout the lesson.
Students will be able to create histograms to visually represent the frequency distribution of a dataset. (Skill)	Students will illustrate histograms in their math journals.	Formative assessment: teacher will circulate to answer questions and offer guidance while students create histograms. This will be an opportunity for the teacher to conduct an informal formative assessment of students’ level of understanding.

Academic Language (3.1.ii)	Histogram Frequency Distribution Range X Axis Y Axis Axes - refers to both the X axis and the Y axis
Required Materials	Document Camera Smart Board Computer with Internet Access YouTube Colored Pencils Math Journals

### Lesson Narrative (55 minutes total)

#### Introduction (~5 minutes)

Students will begin with a warm-up asking students to interpret a histogram the teacher has created from one of the class datasets. Students will have ~2 minutes to “think, pair, share” their observations, and then they will have the opportunity to share out to the class. Students might

notice things such as, “the most people wear a size 4 shoe,” or “only one person wears a size 10 shoe,” etc. The teacher will introduce the vocabulary word histogram, and students will record the definition in their math journals.

### **Direct Instruction (~20 minutes)**

Now, students will watch an ~eight minute Khan Academy video

<https://www.khanacademy.org/math/probability/data-distributions-a1/displays-of-distributions/e/creating-histograms> which explains how to create a histogram by organizing data into “buckets.”

The teacher will pause the video at several points to check for understanding.

**Pause at :33** and ask students, “why is it useful to create a histogram to represent a dataset?”

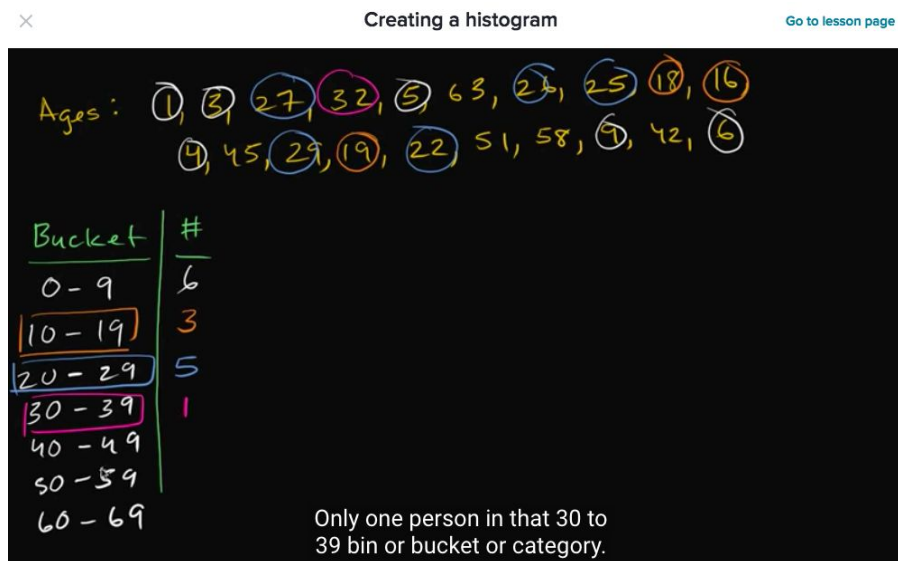
Allow a few students to share out responses. Students should be able to respond that histograms help us visualize data that is hard to understand as just a list of numbers. Refer back to the tables we used to record our class datasets yesterday. Finally, invite students to guess what we will be doing with that data in the future (creating histograms!).

**Pause at 1:36** and invite students to turn and talk about why the narrator chose to “define” the buckets the way he did. After hearing a few responses, (students might say, “because they are even, or because they include all the numbers, etc.) The teacher will introduce the vocabulary word “range,” and explain that it refers to all the numbers between the least and greatest numbers in a dataset. These are all the values that need to be represented in the graph. Refer back to the video and point out that the range of the data in this set includes all the ages between 1 (the age of the youngest person at the restaurant) and 69 (the age of the oldest person in the restaurant). Point out that narrator chose to create groups of 10 to graph this data (1-9, 10-19, etc.).

Students should record the definition of range in their math journals.

**Range:** all the numbers between the least and greatest values in a dataset

**Pause at 3:04** and have students make a frequency distribution table, like the one shown in the video, but using numbers from one of the datasets the collected yesterday in class. (The teacher will pass out copies of the data to each student, but it will be in the form of the question and a list of numbers representing the responses.) Students will organize the data from one of the questions into a frequency distribution table, and record it in their math journals.



After the video, the teacher will introduce the terms, “X axis,” “Y axis,” and, “axes,” which will be used when referring to histograms throughout the unit. Students will record the definitions in their math journals:

**X Axis:** The horizontal side of a graph; on a histogram it contains the numerical values of the response data

**Y Axis:** The vertical side of a graph; on a histogram it contains the number of respondents in each number/category



<b>Axes:</b> the plural of axis
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Finally, the students will use colored pencils to create a histogram with the class dataset they chose. The teacher will circulate to monitor progress, answer questions, and provide guidance.

**Closure (~10 minutes)**

Teacher will refer back to the video by asking, “what did the narrator determine about the restaurant based on the data he collected?” Students should be able to respond that he suggested, “maybe this is a restaurant that gives away toys, since most of the customers are children.” The teacher will tell students that tomorrow, we will think how to analyze data with the goal of solving problems and making decisions. Students will complete an exit ticket that asks them to list the range of a given dataset.

#### Day 4: Developing Research Questions and Beginning Data Collection

Learning Target (3.1.ii)	Evidence of Achievement (3.1.iii)	Assessment (3.2)
Students will understand that histograms can be used to visually represent the frequency distribution of a dataset.	Students will create questions that they plan to graph using histograms.	Summative assessment (see rubric)
Students will understand that they can draw conclusions and make decisions based on the information presented in a dataset. (Concept)	Students will work in partnerships to create a statistical question that aims to solve a problem or suggest a change in their lives.	Summative assessment (see rubric)
Students will work collaboratively in partnerships to address a practical (Skill, Disposition)	Students will work in partnerships to create questions, collect data, graph and interpret results, and suggest action based on the results.	Formal: summative assessment (see rubric)  Formal: student self-assessment (see rubric)

Academic Language (3.1.ii)	Cooperative Learning Rubric
Required Materials	Smart Board Document Camera Poster Paper (for drawing histograms) Pens, Pencils, Markers
Co-teaching Strategies	One teach, one assist

#### Lesson Narrative (~55 minutes)

##### Introduction (~10 minutes)

So what? Now that students understand they can use histograms to visually represent data, which makes it easier to understand, they should be able to apply it in realistic, impactful situations.

The teacher will refer back the video narrator's interpretation of the restaurant data. (Maybe the restaurant sells toys). The teacher will invite students to ask what other actions the restaurant might take based on this data. Students might respond that, if it doesn't already, maybe the restaurant should expand its kids menu, or offer special deals to families dining with children. If students do not make such suggestions, offer them.

Then, the teacher will introduce more examples of datasets and ask students to brainstorm what an analyst might do with the response data.

Example: A basketball coach is trying to decide what drills to do during practice. She decides to make a histogram showing how many free throws (out of ten) the players on the 6th grade team can make. The teacher will display a sample histogram of this data on the board, and students will turn and talk: how could this histogram help the coach make a decision about practice?

Students should be able to respond that, if the histogram shows that most players can only make one or two out of ten shots, a coach might need to spend more time practicing free throws. If most players can make all ten free throws, the coach should spend more time practicing other skills. Now, students will move on to creating and analyzing their own datasets!

### **Direct Instruction: Introducing the Summative Assessment (~15 minutes)**

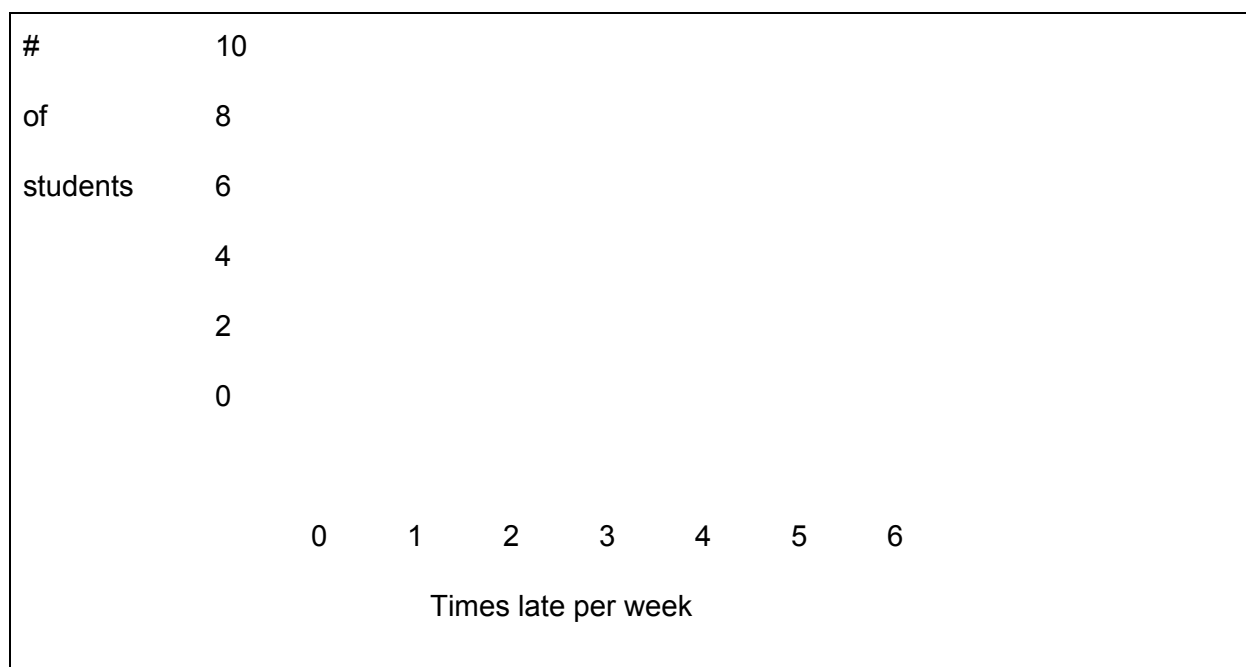
Students will work in partnerships to develop statistical research questions, collect, graph, and analyze class data, then draw a conclusion and suggest an action based on the results. The guidelines are as follows:

1. Project must investigate a statistical question, which anticipates variability in the response data
2. Research question must have a purpose in mind: what will you do with the data you have collected? What questions will you be asking when you analyze it?
3. Data must be accurately represented on a histogram.
4. A conclusion is drawn or an action is suggested based on the data (~one paragraph explaining the results and how they will be used.)

\*\*\*\*I will distribute the both rubrics at this time: for the summative assessment and for the cooperative learning self evaluation. Both will be available on Schoology as well.

Example:

1. Statistical research question: how many times per month are students late to class?
2. Purpose: maybe students need a longer passing period
3. Histogram:



4. Analysis and conclusion: this histogram shows us that 10 students were late six times per week; since so many students are late so often, I argue that students would benefit from a longer passing period!

### **Guided Practice (~15 minutes)**

Once partnerships have generated their research questions and approved them with the teacher, they will record their questions on blank paper and post them around the room. Students will circulate to respond to partnerships' research questions.

### **Closure (~5 minutes)**

Students will have the opportunity to ask remaining questions about the content or the

project. Students will complete an exit ticket that asks them to summarize in 1-2 sentences how they plan to use the data they have collected.

### **Day 5: Concluding Research and Producing Meaningful Histograms**

Learning Target (3.1.ii)	Evidence of Achievement (3.1.iii)	Assessment (3.2)
Students will be able to draw conclusions or make decisions based on the data presented in a histogram. (Skill)	Students will suggest a practical use for the data they have collected and graphed.	Summative assessment (see rubric)

Academic Language (3.1.ii)	Cooperative Learning Self Assessment
Technology	Smart Board Document Camera Math Journals Chart Paper Colored Pencils, Markers, etc.
Co-teaching Strategies	One teach, one assist

### **Lesson Narrative (55 minutes total)**

Teacher will assess students' progress re: the histogram project and address any overarching concerns. Students will have the remainder of the period to finalize their projects and complete the cooperative learning self-assessment. The teacher will remind students that on Monday they will have a chance to present their research and recommendations during the first half of class.

## **Section 4: Analyze and Reflect**

### **4.1 Connections to Theory and Research**

This unit is structured to incorporate several of Marzano's high yield instructional strategies, including taking notes and summarizing information, cooperative learning, and non-linguistic representation. During class time, students will take notes in their math journals and verbally summarize information during small and large group discussions. Students will also have opportunities to summarize information via exit tickets, which allow the teacher to assess learning as the unit progresses. Students will use cooperative learning to complete their summative assessment by working in partnerships. Finally, students will focus on non-linguistic representation of data using histograms and frequency distribution tables.

According to Marilyn Burns, "the possibilities for things to graph should be taken from the interests of the children and experiences that occur in the classroom." In accordance with this principle, I have created multiple opportunities throughout this unit for students to ask meaningful questions about their lives in and out of the classroom through the lens of statistics. Burns also notes that students benefit from "turn and talk" exercises because they allow students to practice articulating their ideas in partnerships or small groups--building confidence--before sharing out to the whole class (Burns 2007 pp. 103-104).

According to both Lombardi and McGuire, students learn best when their learning is authentic, or then relevant to their lives (Lombardi 2007 and McGuire 2007). This practice, although described by McGuire in a social studies context, is consistent with Marilyn Burns' assertion that students should see math as relevant and useful to their lives. The goal of this unit is not only for students to understand, analyze, and create histograms, but to do so with a purpose in mind that is impactful to their existence in the world. So based on these educational practices, I have created a lesson that asks students to combine their knowledge of statistical

questions and histograms with their civic responsibility to be active participants in our democratic society.

## **4.2 Academic Language**

### **Key language functions**

In this unit, language will be used mainly to explain ideas and graphs. Particularly, labeling graphs will be an important skill for students to develop conceptual understanding (why each side is labeled the way it is) and procedural fluency (being able to consistently label histograms correctly).

### **Vocabulary**

Students will be introduced to the following content-specific vocabulary (which they will have the multiple opportunities to apply in class): *statistical question, non statistical question, frequency distribution table, histogram, X axis, Y axis, axes*.

Coming into the lesson, students should be familiar with the following general academic vocabulary: *data collection, analyze, interpret, draw conclusions*.

When I introduce new academic language specific to the content of this unit, I ask students to record these words in their math journals. While they do so, I will display the definition on the board. I will also keep a “word wall” of language relevant to the content we are covering on the board. Finally, I will make all vocabulary available on Schoology as well as resources for additional practice or explanation.

### **Syntax**

The main element of syntax in this unit will be for students to understand how frequency distribution tables and histograms are used to organize data. In class, I will model the creation of frequency distribution tables and histograms several times before asking students to complete them on their own. Students will progress from guided practice to real world application of the concepts. Outside of class, students will have access to online resources through schoology that include examples and links to additional practice and instruction.

## **Elements of Discourse**

Students will be using academic language to describe, analyze and interpret histograms. For example, in class we will practice using these terms both orally and in writing so that students become familiar and comfortable with them. Finally with regard to elements of discourse, I have structured my lesson such that, whenever the teacher gives instructions, they are described in a clear sequence so students know exactly what they are supposed to do (first, next, then, etc.).

### **4.3 Special Needs**

My sixth grade students are members of the school's highly capable cohort; accordingly, they have demonstrated above grade level performance across several content areas. As such, I anticipate that my students will take on a new math unit with confidence, as they usually do. Since I know that some of my students struggle with organization, I have required them to keep math journals, in which they record and keep all their math notes in one place.



### **Annotated Bibliography**

Burns, M. (2007). *About teaching mathematics: A K-8 resource* (3rd ed.). Sausalito, CA: Math Solutions Publications.

→ This resource contains a wealth of effective strategies and examples for elementary and middle school mathematics teachers.

Cole, B., and McGuire, M. (2010) *Making a Difference: Revitalizing Elementary Social Studies*. National Council for the Social Studies.

→ This book contains best practices that prepare students to be active participants in a democratic society.

Lombardi, M. 2007. *Authentic Learning for the 21st Century: An Overview*. Educause Learning Initiative.

→ This resource describes how educators can make learning authentic, therefore meaningful and long-lasting, for students in the 21st century.

Marzano R., Pickering D., and Pollock, J. 2001. *Classroom Instruction that Works*. Association for Supervision and Curriculum Development. Alexandria, VA.

→ This resource describes seven effective strategies for improving students' performance.

Wood, C. (YEAR) *Yardsticks*. Northeast Foundation for Children, Inc. Turners Falls, MA.

→ This book provides an overview of developmental milestones and best educational practices, year-by-year, for school-age students.

## APPENDIX

### Summative Assessment (3.2)

	Completely Meets Expectations (5 points)	Partially Meets Expectations (1-4 points, decided by teacher)	Does Not Meet Expectations (0 points)	Additional Comments
<b>Statistical Question</b>	Project deals with a clearly stated statistical question.	N/A	Project is missing a statistical question.	Comments:          Score___/5
<b>Histogram</b>	Histogram has all of the following: * Title  * Clearly labeled X and Y axes  * Neatly colored  * Completely accurate representation of dataset  * Includes a copy of the data represented in a frequency distribution table	* Histogram is missing a title  * X and Y axes are not labeled, or are labeled inaccurately  * Histogram is not colored, or is sloppy  * Histogram makes errors in representing the dataset  * Does not include a frequency distribution table	Histogram is missing	Comments:          Score___/5
<b>Write up: Purpose and Suggested Action</b>	Write up meets <b>all</b> of the following criteria:  * <b>Introduces</b> the dataset and clearly states a practical purpose for collecting it.  * Accurately <b>summarizes</b> the data collected by students	* Purpose is unclear or not practical  * Makes errors summarizing the data  * Does not refer to the histogram  * Suggests a course of action based on the data,	Write up is missing	Comments:


	<p>* Refers to the <b>histogram</b></p> <p>* Suggests and clearly explains a <b>course of action</b> based on the data</p> <p>* <b>Spelling and grammar</b> are completely correct</p>	<p>but does not clearly explain it</p> <p>* Contains some spelling and grammar errors</p>		Score ____/5
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Total \_\_\_\_/15

### Cooperative Learning Self-Assessment (3.2)

	Me: _____	My Partner: _____	Comments (Optional)
Did a fair share of the work.	Yes      No	Yes      No	
Participated in conversations respectfully.	Yes      No	Yes      No	
Was willing to make compromises to get the project done.	Yes      No	Yes      No	
Wanted to do well on the project.	Yes      No	Yes      No	

**Class Website Access Code: JM63V-JDMPJ**



Course Options

- Materials
- Updates
- Gradebook
- Badges
- Attendance
- Members
- Analytics

Access Code  
JM63V-JDMPJ Reset

Add Materials Options

All Materials

Letter to Parents: Introduction to Statistics

Monday: Materials and Resources

Tuesday: Materials and Resources

Wednesday: Materials and Resources

Thursday: Materials and Resources

Friday: Materials and Resources

Additional Resources for Practice

Week 1 Vocabulary by Day

Family Homework Due Monday 4/30/2018

Family Homework Responses: Due in Class Monday 4/30

Please work with a family member to generate at least three statistical questions that could be asked about your family or community.  
Example: how many hours per week do the people on our street...  
Due Monday, April 30, 2018 at 9:00 am

In-Class Activity for Monday 4/30: Statistical questions about our class

Please post at least five statistical questions that could be asked about our class.  
Example: how many hours per night do the students in Ms. Goff's 2nd period sleep?

Upcoming 13 Add Event

Monday, April 30, 2018

Family Homework Responses: Due in Class

Monday 4/30 9:00 am